

***Abstract of the Disclosure***

**[0031]** A source of high-power femtosecond optical pulses comprises a combination of a relatively short rare-earth doped fiber amplifier (e.g., less than five meters) with a first section of single mode fiber (or other dispersive element) disposed at the input of the amplifier to “pre-chirp” the output from a femtosecond pulse source, and a second section of single mode fiber fused to the output of the fiber amplifier to provide compression to the amplified pulses generated by the fiber amplifier. The rare-earth doped fiber amplifier is formed to comprise a normal dispersion, which when combined with self-phase modulation and distributed gain leads to a regime in amplifiers defined as “self-similar propagation”. In this regime of operation, the fiber amplifier generates high energy pulses with a parabolic shape (the parabolic shape defined as a function of time). These pulses also exhibit a strong linear chirp, where the linear nature of the chirp leads to efficient compression of the pulses.